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GEOGRAPHIC INTELLIGENCE REPORT

ESTIMATE OF FLOOD LOSS RESULTING FROM THE DESTRUCTION OF THE HIGH ASWAN DAM

CIA/RR GR 59-9

30 April 1959

CENTRAL INTELLIGENCE AGENCY

OFFICE OF RESEARCH AND REPORTS

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W A R N I N G

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ESTIMATE OF FLOOD LOSS RESULTING FROM THE DESTRUCTION OF THE HIGH ASWAN DAM

Breaching of the High Aswan Dam would release more water into the narrow Nile Valley than in any flood known to Egypt. Flood waters would pour across the City of Cairo on the 12th day after breaching the dam; the crest of the flood at Cairo could be expected on the 18th day; and the flow of the river would not return to normal levels for more than a month. Except on the Upper Nile near the dam, the water would rise slowly enough so that loss of life could be held to a minimum, but more than two-thirds of the population would be displaced and suffer acutely from exposure and malnutrition. Roads, railroads, communications, and industry would sustain severe damage, but the destruction of irrigation works would have the most far reaching and lasting consequences. Rehabilitation of people, cities, industry, and agriculture would assume staggering proportions and extend over decades.

I. Purpose

This report gives an estimate of the flood damage that would be caused if a single nuclear explosion were to breach completely the High Aswan Dam when it was full of water. It is based on these assumptions:

A. The High Dam could not be completed and filled with water before 1970 and in any given year will be nearest to full capacity (130 billion cubic meters) between November and April.

B. The population of Egypt is about 32 million.

C. No one in Egypt has been warned of the impending burst.

D. Although plans for the High Aswan Dam include provision for large outlets to lower the water level in case of war, this provision is of little significance for the present report because it would take almost 2 months to reduce the water to safe levels.

II. Significance of Flood Figures

The manipulation of Nile water for irrigation and flood control is a highly integrated operation designed to even off the enormous seasonal fluctuation in flow. A High Aswan Dam must necessarily fit into this operation.

In early July, water in the reservoir would be at a relatively low level because, during the preceding 5 months, it had been used for irrigation and natural flow had been minimal. The refilling of the resevoir each year would start with the first floods, which begin in July, and would continue through January. After January the demand for irrigation water would probably exceed the natural inflow, and the water level would again begin to drop. No flood the Nile could produce would completely fill the reservoir in a single year unless some of the tremendous capacity of

Lake Victoria were released through Owen Falls Dam. Under average conditions, at least five years would be required to fill the reservoir after its completion.

At present, during the flood season, Egypt receives the full natural flow through wide open sluice gates. At the peak flood period -- normally in September -- the flow at Aswan rarely exceeds 1 billion cubic meters per day. In the most disastrous flood on record -- in 1878 -- the daily flow at Aswan reached slightly more than 1.1 billion cubic maters. The figure of 0.9 billion is considered the danger point; beyond this, bank repair crews are likely to be activated and evacuation warnings issued. These figures are inconsequential compared with the nearly 6 billion cubic meters of water that would be released on the first day after a break of the High Dam. Even on the twelfth day, with the inundation of Cairo just beginning, the daily flow from the reservoir would amount to 3.5 billion cubic meters.

III. Progress of the Flood

Progress of the flood downstream from the dam has been estimated in 2 stages: the beginning of the flood wave and the beginning of inundation. The beginning of the flood wave would progress down the channel at a fairly rapid rate, reaching Cairo in approximately 3 days. The portion of the flood wave that would overflow the present banks of the river would be much slower and would not reach Cairo for some 12 days.

Twenty-four hours after the break of the dam the Nile Valley would be inundated for a distance of 120 miles below the dam. Some 600,000 people would be killed or displaced during this period. By this time

the initial rise of the river would have extended 270 miles downstream from the dam.

At the end of the second day the water 430 miles downstream would begin to rise, and the valley would be under water for a distance of 190 miles below the dam. By the end of the third day the water would begin to rise at Cairo, 580 miles downstream from the dam; but only 270 miles of the upper valley would be under water.

At the end of the first week of the flood, 580 miles of the Upper Nile Valley would be inundated, and approximately 4,000,000 people would be displaced. Flood waters would overflow the present banks of the river at Cairo on about the 12th day. From this time on the flood would fan out over the Delta, and would rise at a much slower rate than was the case in the upper valley.

At Cairo the crest of the flood would be experienced approximately 18 days after the breach of the dam. The flow of the river would be more than twice that experienced during the usual flood crest at Cairo and approximately 70 percent of the population of Egypt would be displaced. The entire Upper Nile Valley, Cairo, and a large proportion of the Delta would be inundated to a depth of 3 to 15 feet.

Flood conditions would be expected to continue for a period of 45 to 60 days after the breach of the dam. The present banks of the Nile, situated well above the surrounding countryside, would be washed out at many points; and, even after the river flow returned to normal, Nile waters would run in courses outside their normal channels, thus prolonging the state of disaster.

IV. Extent of Anticipated Loss

A. Population

Loss of life would be greatest in the Upper Nile Valley near the dam -- where the bomb burst and the precipitous surge of water would take a high toll. Farther downstream, many of the villages are situated at the edge of the valley or on the lower slopes of the valley wall, thus making escape to high ground relatively easy. With the breaching and over-riding of the river banks at Cairo, which are normally 12 to 15 feet above the level of the surrounding land, the city would rapidly be flooded. A limited number of the residents of Cairo could assemble in the upper stories of modern buildings or on high ground near the city. Most residents of the Delta, however, would have to travel many miles to find refuge. Barring total collapse of communications or the development of mass hysteria, residents of Cairo and the Delta could be evacuated in ample time to escape the path of flood waters.

From the standpoint of health, the majority of the population would suffer most from exposure and lack of food and fuel. Intestinal diseases -- the typhoid-paratyphoid group and the dysenteries -- would be a constant threat; and within a relatively short time malaria could become a primary concern. Persons coming in contact with the heavily contaminated waters of the early flood stages might also receive lethal doses of radiation. With dilution by flow, absorption by soil, and natural decay, the level of contamination in the river water would be reduced to tolerable levels after the initial passage of flood waters.

B. Property

All road, rail, and telephone communication along the Upper Nile would be destroyed. The destruction of these facilities, which are generally situated on embankments slightly above the level of the normal flood, would probably amount to total loss. Many of the buildings in towns and villages along the Upper Nile would be completely destroyed; those remaining would sustain severe damage. As flood waters spread out over Cairo and the Delta, the physical destruction from the force of the water would be reduced, but damage to perishables and equipment would remain high. The older sections of Cairo and most Delta villages contain many flimsy structures that would be destroyed by flood waters. Modern buildings, however, would probably suffer relatively little structural damage. Most of the Egyptian industrial installations would incur severe damage as a result of submersion and silt deposition. The cost of rehabilitating the country's major road and rail network, the communication system, and the commercial and industrial establishment would reach staggering proportions.

Almost 98 percent of the agricultural land of Egypt would be directly in the path of a flood caused by a break of the High Aswan Dam. Such a flood would destroy the complex irrigation system upon which Egyptian agriculture depends and which has permitted the Egyptians to produce two or three crops each year on their intensively cultivated land. In the Upper Nile, where the valley is narrow, the tremendous initial force of the water would demolish the barrages, diversion channels, and other irrigation facilities that have been built up gradually over generations.

Although the force and abrasive power of the water in the Delta would be less, they would probably still be strong enough to wreck many of the irrigation facilities. In addition to the scouring, streambank erosion, gullying, and trenching caused by the initial onslaught, deposition of silt and other debris during later stages of the flood would clog such irrigation channels as remained.

Direct agricultural losses would also result from damage to both unharvested and stored crops, livestock, pastures, and equipment. Since about 80 percent of the population depends on agriculture for its livelihood, the effect of these losses on the country's economy would be devastating. To repair the damage to irrigation and flood control facilities, drain the land, remove excess sediment, rebuild railroads and roads, collect and distribute seed for planting new crops, replace lost livestock, and reestablish marketing facilities -- to mention just a few of the post-flood problems -- would require years of effort and vast amounts of foreign assistance. Furthermore, rehabilitation would have to face the added problem of inadequately controlled seasonal flooding.

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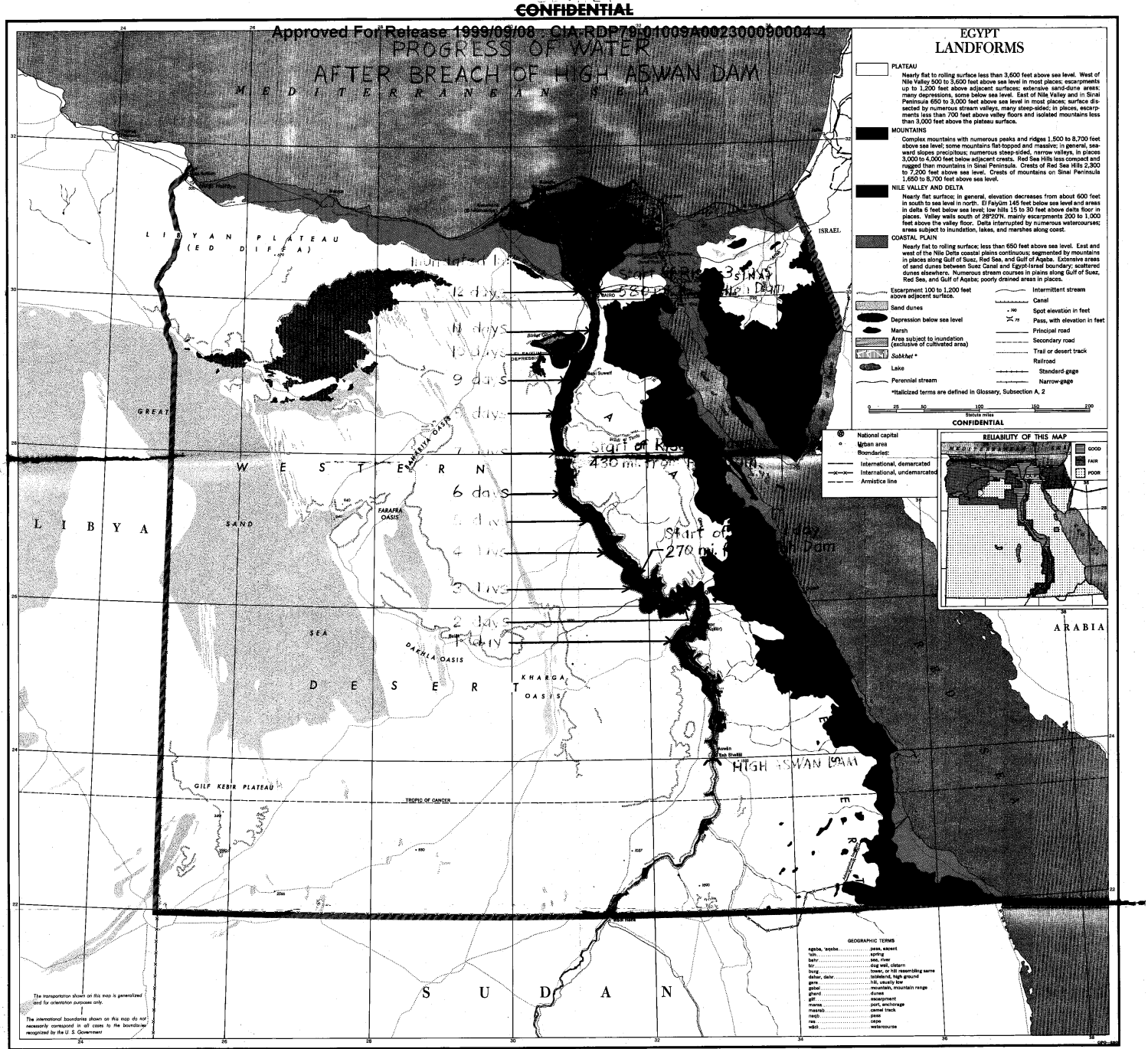

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